PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
LEE, Young-Pil

The Cheonghwa Bldg. 1571-18 Seocho-dong, Seocho-gu,
Seoul 137-874, Republic of Korea

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing *(day/month/year)* **28 DECEMBER 2004 (28.12.2004)**

Applicant's or agent's file reference
PH-21656-PCT

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/KR2004/000536	**13 MARCH 2004 (13.03.2004)**	

International Patent Classification (IPC) or both national classification and IPC
IPC7 C07D 487/22

Applicant
POSTECH FOUNDATION et al

1. This opinion contains indications relating to the following items:

- [X] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [ ] Box No. IV Lack of unity of invention
- [X] Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [X] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [ ] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**
If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/KR
Korean Intellectual Property Office
920 Dunsan-dong, Seo-gu, Daejeon 302-701,
Republic of Korea
Facsimile No. 82-42-472-7140

Authorized officer
JUNG, YOUNG JA
Telephone No. 82-42-481-8164

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
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Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material

   ☐ a sequence listing
   ☐ table(s) related to the sequence listing

   b. format of material

   ☐ in wirtten format
   ☐ in computer readable form

   c. time of filing/furnishing

   ☐ contained in the international application as filed.
   ☐ filed together with the international application in computer readable form.
   ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additioanl copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

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Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-13	YES
	Claims		NO
Inventive step (IS)	Claims		YES
	Claims	1-13	NO
Industrial applicability (IA)	Claims	1-13	YES
	Claims		NO

2. Citations and explanations :

The present invention relates to a disubstituted cucurbituril represented by the following Formula 1 and a method for preparing the same Formula 1, comprising the step of reacting a disubstituted glycoluril represented by Formula 2 and a glycoluril represented by Formula 3 with ormaldehyde.

1. Prior Art

The following documents from the PCT International Search Report have been considered for the purpose of this report:

(D1) WO 0068232 A1 (UNISEARCH LIMITED) 16 NOVEMBER 2000 (16.11.2000)
(D2) WO 03055888 A1 (POSTECH FOUNDATION) 10 JULY 2003 (10.07.2003),
(D3) WO 03004500A1 (POSTECH FOUNDATION) 16 JANUARY 2003 (16.01.2003)

D1 discloses a method for preparing cucurbit[n]urils and cucurbit[s,u]urils and a method of separating cucurbit[n]urils and/or cucurbit[s,u]urils.
D2 relates to a hydroxycucurbituril and derivatives thereof which are expressed by the formula 1, wherein A1 and A2 are as defined n the specification; X is O, S or NH; and n is an integer of 4-20.
D3 discloses water and organic soluble cucurbituril derivatives, their preparation methods, their separation methods and uses.

2. Novelty

None of the prior art documents describe a method for preparing a disubstituted cucurbituril represented by Formula 1, comprising the step of reacting a disubstituted glycoluril represented by Formula 2 and a glycoluril represented by Formula 3 with formaldehyde.

(Continued in the Supplemental Box.)

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Box No. VI Certain documents cited

1. Certain published documents (Rule 43bis.1 and 70.10)

Application No. Patent No.	Publication date *(day/month/year)*	Filing date *(day/month/year)*	Priority date (valid claim) *(day/month/year)*
KR 04069814 A	06.08.2004	30.01.2003	-

2. Non-written disclosures (Rule 43bis.1 and 70.9)

Kind of non-written disclosure	Date of non-written disclosure *(day/month/year)*	Date of written disclosure referring to non-written disclosure *(day/month/year)*

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of :

(Box No.V)

Therefore, the subject-matter of claims 1-13 can be regarded as novel under PCT Article 33(2).

3. Inventive Step

The present invention provides a disubstituted cucurbit[m]uril where m is 5 to 8, represented by the following Formula 1 and a method for preparing a disubstituted cucurbituril represented by Formula 1, comprising the step of reacting a disubstituted glycoluril represented by Formula 2 and a glycoluril represented by Formula 3 with formaldehyde: wherein the disubstituted glycoluril of Formula 2 is prepared by reacting a 1,2-diketone derivative represented by Formula 4 with an urea represented by Formula 5 in the presence of an acid catalyst.

In view of D1, a skilled person in the art could think of a method for producing cucurbit[n]urils, where n is from 4 to 12, comprising the step of mixing substituted and unsubstituted glycoluril with an acid, and heating the mixture to a temperature of from 70 ℃ to 100 ℃ to thereby form cucurbit[n]urils. Novel cucurbi[n]urils, where n = 5 to 10 and substituted cucurbit[s,u]urils, where s = number of substituted glycoluril units, u = number of unsubstituted units and s + u = 4 to 12.

According to D2, a skilled person in the art could expect a hydroxycucurbituril derivative represented by formula 13 which can be prepared by reacting hydroxycucurbituril derivative represented by formula 8 with Cl-C30 alkyl halide in the presence of a base.

The skilled person having knowledge of the teaching of D3 would have been able to predict that a method for preparing a glycoluril derivative having the formula (2), the method comprising the steps of: adding an aqueous acidic solution or an acid-containing organic solvent to a mixture of a urea derivative (B) and a cyclodione compound (C) for reaction, mixing and stirring a compound having the formula (2) and an aldehyde compound having the formula (A), and adding acid to the reaction mixture and stirring to complete the reaction.

Furthermore, the present invention does not show a surprising effect over the inventions of the prior art documents.

Therefore, the present invention is considered to be a simple combination of the inventions of the prior art documents D1 - D3, and consequently an inventive step cannot be acknowledged for the subject matter of claims 1 to 13 (Article 33(3) PCT).

4. Industrial Applicability

The subject-matter of claims 1 to 13 is considered to be industrially applicable under PCT Article 33(4).